

***BEST PRACTICES FOR DATA QUALITY OVERSIGHT  
OF  
ENVIRONMENTAL SAMPLING AND TESTING ACTIVITIES***

**Final Report**



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## **ACKNOWLEDGEMENTS**

This report documents Best Practices identified by the DoD EDQW, Best Practices Subgroup. The subgroup was chaired by the Army, first by Mr. Kevin Coats and finally by Mr. Larry Becker of the Army Corps of Engineers. Principle contributors to report preparation included Mr. Steve Eikenberry, Naval Facilities Engineering Service Center; Ms. Jackie Sample, Chief of Naval Operations and Naval Sea Systems Command; Ms. Maude Bullock, Chief of Naval Operations, and Dr. Mollie TeVrucht, Army Corps of Engineers. The report has been coordinated with DoD components. The point of contact is Ms. Jackie Sample, CNO N457I, Chair of the DoD EDQW. She may be reached at 843/764-7337 ext. 11 or by e-mail at [samplejh@navsea.navy.mil](mailto:samplejh@navsea.navy.mil).

## **EXECUTIVE SUMMARY**

This report documents several best practices identified by the Department of Defense (DoD) to assure that data collected to support decisions in the environmental program are of known and documented quality and can be used as intended. This report was developed by the DoD Environmental Data Quality Workgroup (EDQW), which is tasked to develop and coordinate environmental sampling and testing policy. The report was prepared in partial response to a request dated July 2, 1997 by the Director of the Federal Facilities Restoration and Reuse Office (FFRRO) of the U. S. Environmental Protection Agency. Additionally, this report responds to issues raised in the February 21, 1997, DoD Inspector General Report No. 97-098 and provides a framework for finalizing the DoD EDQW Strategy. These best practices are in use, in part, by one or more of the DoD Components (Army, Navy, Air Force and Defense Logistics Agency). Best practices discussed in the report include:

- Using Data Quality Objectives (DQOs)
  - Use A Systematic Planning Process for Data Collection Activities
  - Involve Regulators
- Improving Policy, Guidance, and Documentation
  - Develop DoD Policy and Guidance Documents
  - Implement ISO Guide 25
  - Implement ISO Guide 58
  - Implement ANSI/ASQC E4
- Improving Laboratory Oversight Practices
  - Perform Laboratory Audits
  - Include Proficiency Testing Samples
  - Require Standard Electronic Data Deliverables
  - Validate Data
  - Institute the National Environmental Laboratory Accreditation Program
- Improving Management and Contracting Processes
  - Share Laboratory Performance Data
  - Use Standard Performance Based Laboratory QA/QC Contracts
  - Maintain DoD Core Capability in Environmental Analysis
  - Use a Quality Assurance Officer

DoD has tasked the EDQW to identify best practices that add quality, save time, and reduce costs throughout the Department's environmental cleanup and compliance programs and to make recommendations regarding their implementation. Accordingly, each of these best practices is rated by the EDQW against the criteria:

- Increases Quality
- Saves Time
- Reduces Cost

Generation of the right quantity of quality data will reduce costs and allow decisions to be made with greater speed and better accuracy. The recommendations contained in this report will be used by the EDQW as a strategic framework to help DoD achieve these goals.

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# **BEST PRACTICES FOR DATA QUALITY OVERSIGHT OF ENVIRONMENTAL SAMPLING AND TESTING ACTIVITIES**

## **INTRODUCTION**

This report documents several DoD best practices for assuring that data of known and documented quality are obtained during environmental investigations and that logical decisions based on quality data drive remedy selections. This report was developed by the DoD Environmental Data Quality Workgroup (EDQW) which is tasked to develop and coordinate environmental sampling and testing policy. The report was prepared in partial response to a request by the U. S. Environmental Protection Agency, Office of Solid Waste and Emergency Response (OSWER), Federal Facilities Reuse Office (FFRRO), dated July 2, 1997, “to define those processes that contribute to uniform data collection and analysis, reporting, and interpretation thus improving the quality of the data, saving time, or reducing program costs.” Additionally, this report addresses issues raised in the February 21, 1997 DoD Inspector General Report No. 97-098 and provides a framework for finalizing the EDQW Strategy for improving DoD environmental sampling and testing activities.

## **BACKGROUND**

Prompted by a multi-million dollar laboratory fraud issue, EPA Region 9’s laboratory program was audited by the EPA Office of the Inspector General (OIG) in 1995 (Laboratory Data Quality at Federal Facility Superfund Sites, E1SKB6-09-0041-7100132, 20 March 1997). This audit led to 1997 audits of all EPA regions. In 1997, the DoD IG also performed an audit of environmental laboratory services, focusing primarily on contracted services (DoD IG Audit Report on Laboratory Support Services for Environmental Testing, Report No. 97-098, 21 February 97). The DoD audit looked at both compliance and cleanup programs. Also in response to laboratory fraud issues, the California Military Environmental Coordinating Committee (CMECC) issued a report in March 1997: *Best Practices for the Detection and Deterrence of Laboratory Fraud*. These reports were used as resources by the EDQW to identify and prioritize this compilation of best practices.

## **OBJECTIVE**

Best Practices identified by the DoD fall into several broad categories and cover a range of activities. Some are current practice among the components, while others can be easily implemented. Some will require additional work to implement DoD-wide. The categories and Best Practices discussed in the report include:

- Using Data Quality Objectives (DQOs)
  - Use a Systematic Planning Process for Data Collection Activities
  - Involve Regulators

- Improving Policy, Guidance, and Documentation
  - Develop DoD Policy and Guidance Documents
  - Implement ISO Guide 25
  - Implement ISO Guide 58
  - Implement ANSI/ASQC E4
  
- Improving Laboratory Oversight Practices
  - Perform Laboratory Audits
  - Include Proficiency Testing Samples
  - Require Standard Electronic Data Deliverables
  - Validate Data
  - Institute the National Environmental Laboratory Accreditation Program
  
- Improving Management and Contracting Processes
  - Share Laboratory Performance Data
  - Use Standard Performance Based Laboratory QA/QC Contracts
  - Maintain DoD Core Capability In Environmental Data Analysis
  - Use a Quality Assurance Officer

For each best practice, brief discussions are provided about the implementation status, the objective, and recommendations to further improve the practice. Each best practice is assessed for its effect on quality, schedule, and cost. The rating system used is:

- A** Definite demonstrated improvement. Improvement is quantified or quantifiable.
- B** Probable improvement. May not be immediately quantifiable.
- C** Neutral.
- D** Definitely will not improve.

The improvement in data quality that would result from implementation of each best practice is measured relative to the quality of data obtained using existing DoD procedures. The general *status quo* used as a basis for comparison may not be reflective of the standard operating procedure of a particular component or branch of service within a component relating to a specific suggested best practice.

The Best Practices described herein were selected from a comprehensive list of recommendations and best practices suggested by Components, CMEEC, EPA guidance documents, and EPA and DoD IG Reports. Practices were then rated and prioritized. These ratings are assigned by the EDQW based on an evaluation relative to whether the practice adds to quality, saves time, and reduces costs. Ratings of Best Practices are compiled in Table 1.

**TABLE 1 - RATINGS OF DoD BEST PRACTICES**

	<b>Increases Quality</b>	<b>Saves Time</b>	<b>Reduces Costs</b>
<b>USING DATA QUALITY OBJECTIVES</b>			
<i>Use a Systematic Planning Process for Data Collection Activities</i>	<b>A</b>	<b>A</b>	<b>A</b>
<i>Involve Regulators</i>	<b>A</b>	<b>A</b>	<b>A</b>
<b>IMPROVING POLICY, GUIDANCE, AND DOCUMENTATION</b>			
<i>Develop DoD Policy and Guidance Documents</i>	<b>A</b>	<b>B</b>	<b>A</b>
<i>Implement ISO Guide 25</i>	<b>A</b>	<b>B</b>	<b>B</b>
<i>Implement ISO Guide 58</i>	<b>A</b>	<b>B</b>	<b>B</b>
<i>Implement ANSI/ASQC E4</i>	<b>A</b>	<b>C</b>	<b>B</b>
<b>IMPROVING LABORATORY OVERSIGHT PRACTICES</b>			
<i>Perform Laboratory Audits</i>	<b>A</b>	<b>D</b>	<b>B</b>
<i>Include Proficiency Testing Samples</i>	<b>A</b>	<b>C</b>	<b>B</b>
<i>Require Standard Electronic Data Deliverables</i>	<b>B</b>	<b>B</b>	<b>A</b>
<i>Validate Data</i>	<b>A</b>	<b>D</b>	<b>B</b>
<i>Institute the National Environmental Laboratory Accreditation Program</i>	<b>A</b>	<b>A</b>	<b>A</b>
<b>IMPROVING MANAGEMENT AND CONTRACTING PRACTICES</b>			
<i>Share Laboratory Performance Data</i>	<b>A</b>	<b>B</b>	<b>A</b>
<i>Use Standard Performance Based Laboratory QA/QC Contracts</i>	<b>B</b>	<b>B</b>	<b>B</b>
<i>Maintain DoD Core Capability in Environmental Analysis</i>	<b>B</b>	<b>B</b>	<b>B</b>
<i>Use a Quality Assurance Officer</i>	<b>B</b>	<b>C</b>	<b>B</b>

**RATINGS:**

**A - Definite demonstrated improvement. Improvement is quantified or quantifiable.**

**B - Probable improvement. May not be immediately quantifiable.**

**C - Neutral.**

**D - Definitely will not improve.**

# DoD BEST PRACTICES FOR DATA QUALITY OVERSIGHT OF ENVIRONMENTAL SAMPLING AND TESTING ACTIVITIES

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## USING DATA QUALITY OBJECTIVES

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The Data Quality Objective (DQO) Process is a strategic planning approach that is used to prepare for data collection activities. The DQO Process establishes specific objectives for an environmental study or sampling program and focuses data collection and analysis to meet those objectives. Appropriate use of the DQO process achieves two major objectives: (1) it assures that the type, quantity and quality of data collected are appropriate for the decision at hand and (2) it eliminates the collection of unnecessary, redundant and overly precise data.

Involvement of regulatory technical staff is needed throughout the DQO process. In particular, Federal, State, and regional regulatory agency technical staffs need to be involved up front in site investigation and remediation projects. Working with regulators throughout project planning and execution helps to assure that data quality objectives are appropriate for their intended use, information is shared by all parties, and they reach agreed upon goals.

- **USE A SYSTEMATIC PLANNING PROCESS FOR DATA COLLECTION ACTIVITIES**

**Best Practice:** Use a systematic planning process for designing data collection activities to ensure that the requisite type, quality and quantity of data are obtained to meet project objectives. DQOs are established for each project by technical staff in consultation with stakeholders, such as regulators, at the beginning of an investigation and in the design and execution of data collection and remedial action activities. The DQO process is typically documented in the Quality Assurance Project Plan (QAPP) and may be further defined in site-specific Field Sampling Plans (FSPs).

**Implementation Status:** DoD uses DQOs extensively for the cleanup program and to a lesser extent in the compliance program. DQO guidance is provided in *US EPA Guidance for the Data Quality Objectives Process, EPA QA/G-4, September 1994*. DoD incorporates this document by reference in many service-specific documents. Other guidance is provided by the USACE in Engineering Manual 200-1-2, *Technical Project Planning Process, Guidance for HTRW Data Quality Design*. Recently, the USACE has updated EM-200-1-2, which outlines a four-phase Technical Planning Process (TPP). The TPP can be used at small, simple sites as well as large, complex sites.

**Discussion:** In the DQO process, decision-makers define data requirements and acceptable levels of data error based on data uses during planning, site investigation, engineering design, and remediation. The goal of the DQO process is to minimize expenditures while producing data of sufficient quality and quantity needed to make decisions. Data requirements are determined by site and project strategies as well as the effects of cost, schedules, and other constraints. The advantages of this approach to project planning are that the right data are gathered within the

constraints of the project so that data quality and quantity are based on intended use at various stages of the process. The short-term disadvantage is the up-front planning time required by technical personnel and stakeholders to properly establish definitive DQOs. The DQO Process, as defined by EPA in QA/G-4, is a seven-step process for “data collection efforts that will require or result in a substantial commitment of resources.”

In the Technical Planning Process, the USACE has defined a graded approach for planning data collection activities, which is designed to provide a sound basis for site decisions and accelerates progress to site closeout. The process includes four phases, including the establishment of DQOs, and it implements an overarching quality management system based on ANSI/ASQC E-4. (See DoD Best Practice “Implement ANSI/ASQC E-4.”)

Because DQOs are performance based, the process promotes the use of expedited site characterization and innovative monitoring technologies that may prove to be more cost effective or technically superior. DQOs provide an operational tool for facilitating the use of Performance Based Measurement Systems (PBMS), thereby replacing traditional reference methods with improved technology, where appropriate.

**Recommendations:** The EDQW should continue to emphasize DQOs and incorporate a systematic planning process for data collection activities into policy documents for both the cleanup and compliance programs. The EPA QA/G-4 document and the USACE TPP provide models to accommodate both small and large projects and include the use of definitive DQOs for sound decision making within project restraints. Appropriate technical staff (chemists, geologists, engineers, etc.) must be involved in setting and assessing DQOs to ensure proper use of the process. In addition, laboratories should be involved up front in the DQO planning process. Finally, appropriate personnel, such as remedial project managers and sampling personnel, should receive DQO training as part of their initial training process, and refresher training at specified intervals, to ensure an operable understanding of DQO application.

Rating	Improves Quality	Saves Time	Reduces Cost
Use a Systematic Planning Process for Data Collection Activities	A	A	A

- **INVOLVE REGULATORS**

**Best Practice:** Involve EPA, and other cognizant regulatory agency technical staff, throughout the project. This is especially critical at junctures such as developing Data Quality Objectives (DQOs) and incorporating the use of innovative monitoring and analytical technologies. EPA and DoD should also share information on laboratory capabilities.

**Implementation Status:** DoD policy promotes timely acceptance of EPA and other regulatory agency approved performance based improvements in sample collection, preparation and analytical techniques. DoD encourages up-front planning which involves the regulators so that cost effective data are gathered to meet project needs.

**Discussion:** Involvement by Federal, State, and regional regulatory agency technical staffs working in partnership throughout the life cycle of DoD restoration projects will ensure that appropriate DQOs and Quality Assurance Project Plans (QAPPs) are established and implemented. Joint participation will enable all parties to focus on crucial issues and identify prompt and appropriate resolutions. Involvement of technical staff will also facilitate using Performance Based Measurement Systems (PBMS), which promote the use of new monitoring technologies, field analytical techniques and laboratory testing methods to take advantage of cost efficiencies which can be realized from state of the art innovations.

**Recommendations:** The EDQW should continue to engage cognizant regulators regarding proactive involvement in environmental programs, and in particular seek involvement of regulatory technical staffs for setting and assessing data quality objectives. In addition, the EDQW and EPA headquarters should work together to promote appropriate use of PBMS and provide consistent guidance to the field, both on a program-wide and project specific basis.

Rating	Increases Quality	Saves Time	Reduces Cost
Involve Regulators	A	A	A

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## IMPROVING POLICY, GUIDANCE, AND DOCUMENTATION

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Extensive guidance developed both by DoD and other agencies is in widespread use throughout DoD's environmental programs. As guidance is refined and updated, DoD issues policy and adapts the program to accommodate the updates. Best Practices include:

- **DEVELOP DoD POLICY AND GUIDANCE DOCUMENTS**

**Best Practice:** DoD policy and guidance documents provide thorough and extensive program guidance. DoD updates these guidance documents as environmental programs develop to reflect new standards and innovative methods.

**Implementation Status:** Each DoD Component develops and maintains policy and guidance documents tailored to its individual needs to ensure effective and efficient compliance with environmental regulations. Examples of these documents include:

U. S. Army Corps of Engineers EM 200-1-1, *Validation of Analytical Chemistry Laboratories*, 1 July 1994

U. S. Army Corps of Engineers EM 200-1-6, *Chemical Quality Assurance for HTRW Projects*, 10 October 1997

HQ Air Force Center for Environmental Excellence, *Quality Assurance Project Plan Version 3.0*, March 1998

Chief of Naval Operations OPNAVINST 5090.1B CH-1 of 25 August 1997, Chapter 25 "Sampling and Laboratory Testing," 2 February 1998

Naval Sea Systems Command, *Navy Environmental Compliance Sampling and Field Testing Procedures Manual*, NAVSEA T0300-AZ-PRO-010, 10 June 1997

*Navy Installation Restoration Laboratory Quality Assurance Guide*, February 1996

**Discussion:** The DoD EDQW has established a library of information, policy, and guidance documents related to environmental sampling and testing. These documents are updated regularly to accommodate program changes and have the flexibility to accommodate new information. Policy and guidance documents are vital to execution because they direct the individuals who implement and carry out quality assurance programs within each of the components.

**Recommendations:** The EDQW should continue to update and/or develop policy and guidance. The process should include a review of all DoD environmental guidance documents to determine the best approach to developing documents for DoD-wide use. DoD-wide Sampling and Laboratory Quality Assurance Procedures Manuals should be a top priority.

Rating	Increases Quality	Saves Time	Reduces Cost
Develop DoD Policy and Guidance Documents	A	B	A

- **IMPLEMENT ISO GUIDE 25**

**Best Practice :** Adopt a policy to require personnel, equipment, and a quality system that meet ISO Guide 25 *General Requirements for the Competence of Calibration and Testing Laboratories* for environmental testing activities; this policy will include field analysis.

**Implementation Status:** The DoD EDQW has recommended the adoption of ISO Guide 25 as a uniform quality system standard for testing. A promulgation letter is currently in draft form and is being reviewed. In the interim, DoD component services are implementing ISO Guide 25 for both laboratory and field testing on an individual basis. For example, the policy to implement ISO 25 was recently issued in Chief of Naval Operations *Environmental and Natural Resources Program Manual*, OPNAVINST 5090.1B CH-1 of 2 February 1998, Chapter 25, “Sampling and Laboratory Testing.”

**Discussion:** A comprehensive consensus standard such as ISO Guide 25 is useful as the basis for producing program policy, guidance, and sampling and analysis plans for environmental data gathering. ISO Guide 25 sets general criteria to ensure the competence of testing laboratories (mobile and fixed). The criteria compliment the DQO process and provide uniform, minimum requirements for testing laboratories. Uniform requirements set a “level playing field” and facilitate compliance assessment activities. Use of ISO Guide 25 for field testing activities also assures that important quality systems are in place for activities that are often considered the weakest link in the data collection process.

**Recommendations:** The EDQW should officially implement a policy to require that laboratories performing environmental testing for the DoD comply with ISO Guide 25. The EDQW should develop an overarching quality system for all DoD environmental sampling and testing to unify existing component programs, and use this as a basic criterion for laboratory assessment. The quality system, method specific criteria, and related documents and checklists also provide a platform for a DoD-wide laboratory approval or accreditation program. Use of ISO Guide 25 is also consistent with the quality system defined in the USEPA’s National Environmental Laboratory Accreditation Program (NELAP).

Rating	Increases Quality	Saves Time	Reduces Cost
Implement ISO 25	A	B	B

- **IMPLEMENT ISO GUIDE 58**

**Best Practice:** All DoD component and private environmental laboratories supporting DoD environmental restoration and compliance activities need credentials to perform testing. Accreditation programs should be based on an ISO Guide 25 quality system, and operated and recognized per criteria in ISO Guide 58, *Calibration and Testing Laboratory Accreditation Systems, General Requirements for Operation and Recognition*.

**Implementation Status:** DoD is moving from individual laboratory approval programs to broad-spectrum environmental laboratory accreditation programs conforming to ISO Guides 25 and 58 Standards. DoD supports the development of a National Environmental Laboratory Accreditation Program (NELAP) to demonstrate laboratory competency and is considering becoming an Accreditation Authority for in-house laboratories under the NELAP.

**Discussion:** Accreditation programs should grant formal recognition of laboratories that have been assessed against the “general requirements” specified in ISO Guide 25. The accreditation program should also address “specific requirements” in evaluating the scope of testing performed by the laboratory and accommodate both prescriptive and performance based QA approaches, including the EPA PBMS initiative. For DoD, the accreditation should document and attest to conformance of the laboratory quality system to all elements of ISO Guide 25, as well as any DoD component-specific elements.

The scope of the laboratory assessments should include:

- Review of current/historical Proficiency Testing (PT) sample results
  - Review of laboratory quality assurance plans and standard operating procedures
  - Performance of on-site laboratory audits.

Use of ISO Guides 25 and 58, for assessing laboratory competence and laboratory accreditation system comparability, will facilitate a level playing field for sharing assessment information. As a result, laboratory evaluations (laboratory audit reports, PT results, and other internal and external documented assessments) can be used by all components and should be available throughout the DoD user community.

**Recommendations:** Until a national program is developed and implemented, the EDQW is working to unify component programs to promote uniform standards of quality for laboratory assessment and approval/accreditation. The EDQW should continue to support development of the NELAP and consider becoming an Accreditation Authority under the National Environmental Laboratory Accreditation Conference (NELAC) which will oversee the NELAP. Component laboratory evaluation systems could supplement the NELAP system for use in accrediting laboratories and focus on overall DoD and project specific requirements.

Rating	Increases Quality	Saves Time	Reduces Cost
<b>Implement ISO 58</b>	<b>A</b>	<b>B</b>	<b>B</b>

- **IMPLEMENT ANSI/ASQC E4**

**Best Practice:** Use ANSI/ASQC E4-1994, *Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs* as the basis for an over-arching system for quality management of environmental data collection and evaluation activities. Use related ISO standards, such as ISO 25, 58, and ISO 9000 (international standards on quality management and quality assurance) and ISO 14000 (environmental management systems) series standards, as appropriate, for more specific or supplemental guidance.

**Implementation Status:** In the United States Environmental Protection Agency (EPA) Quality System Series, QA/G-0, EPA provided an overview of the policy and philosophy behind EPA's Quality System, the Quality System's components and their interrelationships. In QA/G-0, EPA noted the adoption of E-4 as the basis for EPA's Quality Manual. In a companion document, EPA QA/R-1, *EPA Quality Systems Requirements for Environmental Programs*, EPA noted that QA/R-1 would be the external policy document by which EPA announces its implementation of E4. Currently, EPA is sponsoring an Intergovernmental Data Quality Task Force (IDQTF), under the direction of OSWER/FFRRO, to attain a set of mutually accepted systems requirements for the management of environmental data quality related to all environmental media, beginning with hazardous wastes. The IDQTF is using E-4 as a model for developing more specific system requirements. The DoD EDQW plans to recommend adoption of the E4 Standard to parallel EPA implementation.

**Discussion:** A consistent DoD quality system will provide the needed management and technical practices to assure that environmental data used to support decisions are of adequate quality and usability for their intended purpose. The DoD quality management system needs to describe policies, objectives, principles, organizational authority, responsibilities, accountability, and an implementation plan for ensuring an appropriate level of quality for environmental data collection and evaluation.

**Recommendations:** Based on the decision by EPA to implement E-4, this standard should be used as a guide for development of the DoD environmental data quality management plan. The EDQW should continue to participate in the IDQTF to define an agreement as to what constitutes an acceptable quality system. The EDQW has recommended that EPA include in the IDQTF other government agencies who are involved in environmental sampling and testing, in addition to DoE and DoD.

Rating	Increases Quality	Saves Time	Reduces Cost
<b>Implement E4</b>	<b>A</b>	<b>C</b>	<b>B</b>

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## IMPROVING LABORATORY OVERSIGHT PRACTICES

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The EDQW is responsible for the quality of the data used to make environmental decisions. Using a quality systems approach such as ISO Guide 25 to set standards, DoD can improve laboratory oversight while reducing costs.

- **PERFORM LABORATORY AUDITS**

**Best practice:** Laboratory assessments consist of on-site audits to review and verify compliance with general quality systems, methods and project specific criteria. An initial audit is performed prior to sample submission. In addition, periodic audits are performed during the life of the contract to assess maintenance of proficiency.

**Implementation Status:** DoD components have QA/QC programs in place which typically require on-site assessments of contract testing laboratories. Some components have accreditation requirements that include on-site assessments. DoD is working to develop a uniform quality system, standard audit criteria and a program of reciprocal recognition of each component's audit systems.

**Discussion:** Laboratory audits evaluate numerous items which impact the quality of data. Audits include the evaluation of management, technical expertise, facilities, equipment, reference materials, methods, calibration, training, documentation and reporting. A pre-performance audit can identify the capabilities of a laboratory before any samples are submitted. Annual follow-on audits can be used to identify problems and deficiencies so they can be corrected early in the project saving both time and money. Audits also send the message that the government will closely monitor contract laboratory performance which may be a deterrent to fraud.

**Recommendations:** Audits should be performed to evaluate a laboratory's conformance with ISO Guide 25 quality systems criteria, specific testing procedures, and, where applicable, the EPA's Good Automated Laboratory Practices (GALP). Audits should be performed initially and periodically throughout the life of the project or contract. The EDQW should promote the exchange of audit information between the components. Copies of the audit report should be provided to the appropriate DoD Quality Assurance Officer for dissemination. Historical audit reports should be used as a reference for follow-on audits.

Rating	Increases Quality	Saves Time	Reduces Cost
Perform Laboratory Audits	A	D	B

- ***INCLUDE PROFICIENCY TESTING SAMPLES***

**Best Practice:** Proficiency testing (PT) samples can demonstrate a laboratory's proficiency to analyze selected analytes. Periodic analysis of PT samples can provide an on-going check to determine if proficiency is maintained. Single blind and double blind samples are used as an effective QA/QC tool for detection and deterrence of environmental laboratory performance problems, including fraud. DoD components should share the results of PT sample testing.

**Implementation Status:** DoD reviews the EPA Water Pollution/Water Supply PT sample results and each component uses PT samples to evaluate laboratory performance. The Army has used PT samples developed in-house, the Air Force uses double-blind PT samples, and the Navy uses commercially available PT samples.

**Discussion:** PT samples are not only useful for assessing proficiency and identifying laboratory problems, but they also send a message to the laboratory community that DoD intends to actively assess lab performance. These PT tools can be used in a variety of combinations and at variable frequency depending on the size, duration, and complexity of a project or contract.

**Recommendations:** The EDQW should develop a program by which components can share individual laboratory PT sample results. The EDQW should work with EPA as they transition to using commercial PT sample providers and consider using these sources for qualification of laboratories to perform DoD work. The EDQW should monitor the AFCEE double-blind PT sample program for cost and effectiveness and consider using it DoD-wide as a method for monitoring lab data quality. The EDQW should also consider using the USACE single-blind Program as an additional DoD-wide QA resource. The EDQW should review available PT sample services and make recommendations on how to incorporate the EPA PT sample program and existing DoD PT sample programs to support an overall QA oversight strategy for DoD environmental testing.

Rating	Increases Quality	Saves Time	Reduces Cost
<b>Include Proficiency Testing Samples</b>	<b>A</b>	<b>C</b>	<b>B</b>

- **USE STANDARD ELECTRONIC DATA DELIVERABLES**

**Best Practice:** A standard electronic data format should be selected for use by all components. All chemical data should be provided in this format, which should be compatible with global information system (GIS) database requirements. Basic data validation should be performed electronically, using a program based on the standard electronic data format. Laboratories should comply with the EPA’s Good Automated Laboratory Practices (GALP).

**Implementation Status:** The Department of Energy (DoE) has developed an electronic data format titled “Department of Energy Environmental Management Electronic Data Deliverable Master Specification,” commonly known as DEEMS. DoD is evaluating the use of DEEMS as a standard electronic data deliverable (EDD) and as a tool for electronic data validation. Currently the Defense Environmental Security Corporate Information Management (DESCIM) Program Office is developing a standard EDD and data base structure. Components are supporting this effort and participate in a DESCIM work group to define requisite data elements for sampling and testing. The U.S. Army Corps of Engineers has developed an electronic data format and accompanying data processing software. The data format and data processing software are in use by two divisions, other federal agencies, and private industry. The Air Force Center for Environmental Excellence (AFCEE) has developed and implemented a similar program, the Environmental Restoration Program Information Management System (ERPIMS).

**Discussion:** DESCIM plans to develop a standard EDD and database, and then allow each component to determine if it will be adopted. Common electronic data formats will allow transfer of data among the components. Also, a common format enables efficient data entry and use of GIS databases to manage, track and query historical data. Standard electronic data will facilitate computer validation of the data. While electronic data validation cannot replace manual data validation, it can save time and increase accuracy for assessment of general data quality indicators such as spike recoveries, holding time excursions, and blank contamination. Some commercially available data validation software is capable of detecting certain types of fraud. Use of such software can serve as a deterrent to fraudulent laboratory practices.

**Recommendation:** The EDQW should evaluate the available electronic data formats and select one as the DoD-wide data transfer standard. The EDQW should also evaluate electronic data validation software and make recommendations regarding it’s use.

Rating	Increases Quality	Saves Time	Reduces Cost
Use Standard Electronic Data Deliverables	B	B	A

- **VALIDATE DATA**

**Best Practice:** Review and validate data collected for restoration or compliance program support. Determine the amount of data validation required during the DQO process. Summarize and report results.

**Implementation Status:** DoD currently reviews the quality and usefulness of the data collected as part of the Data Quality Objective (DQO) Process.

**Discussion:** Data review and validation ensure the reliability of analytical data. When performed in conjunction with previously determined DQOs, data of sufficient quality and quantity will be obtained for making decisions.

**Recommendations:** Data validation requirements should be identified and documented in advance of any sampling and analysis. Data validation requirements should be specified using a tiered approach oriented to the DQOs and specified in the QAPP, where applicable. Sample collection information should be included in this review because the external environment can impact the validity of the sample and the usability of analytical data. Summary tabulation of data and associated “flags” should be provided in a standard format to facilitate data review. The EDQW should continue to work with the IDQTF to develop common data validation practices for Federal departments/agencies.

Rating	Increases Quality	Saves Time	Reduces Cost
Validate Data	A	D	B

- ***INSTITUTE THE NATIONAL ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM (NELAP)***

**Best Practice:** DoD, DoE, EPA and other affected departments and regulatory agencies are partnering to develop and implement a national program which sets minimum criteria for laboratory competency, assesses laboratories against those criteria, and monitors on-going proficiency through a uniform laboratory accreditation system, such as the USEPA National Environmental Laboratory Accreditation Program (NELAP). In addition, components should consolidate program requirements and institute a DoD-wide laboratory approval program, consistent with the NELAP, to achieve uniformity in program requirements.

**Implementation Status:** EPA is working to develop and implement the NELAP, and DoD is an active participant in standing committees and subgroups tasked with program development. The proposed program incorporates uniform quality standards and reciprocal recognition of laboratory accreditation based on ISO Guides 25 and 58, respectively. The DoD has also recognized the need to develop a consolidated laboratory approval program among Components, consistent with NELAP criteria, and the EDQW has already begun this process.

**Discussion:** EPA has the lead to set uniform quality and accreditation requirements for environmental laboratory testing, which will facilitate the comparison of laboratory performance and reciprocal recognition of laboratory services. The DoD fully supports the NELAP initiative.

**Recommendations:** DoD and EPA policy makers should work to achieve uniform laboratory quality and accreditation standards so that laboratories performing environmental testing meet minimum performance criteria and demonstrate on-going proficiency. Established standards must conform with International Standards for laboratory testing to ensure the widest acceptance of decisions based on testing data. The EDQW should incorporate ISO standards through Component policy. In addition, the EDQW should continue to be involved in the NELAC process and consider applying for NELAC recognition as an Accreditation Authority. This would enable DoD to accredit in-house laboratories, thereby reducing national security concerns from external inspections and inconsistency from using State programs, while achieving mutual recognition from all Federal, state and territorial NELAP Accreditation Authorities. In addition, this would allow DoD to accept NELAP accreditation, on a matrix and method specific basis, as initial demonstration of a private sector laboratory's competency to perform DoD testing. This would reduce costs, by eliminating laboratory pre-approval inspections (restoration testing), and allow DoD to focus scarce resources on DoD and project specific requirements, including proper oversight of environmental sampling and testing activities.

<b>Rating:</b>	<b>Increases Quality</b>	<b>Saves Time</b>	<b>Reduces Cost</b>
<b>Institute NELAP</b>	<b>A</b>	<b>A</b>	<b>A</b>

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## IMPROVING MANAGEMENT AND CONTRACTING PRACTICES

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Management needs to facilitate exchange of laboratory performance information throughout DoD to rapidly identify data quality problems so that they do not become widespread. In addition, using performance based criteria as a basis for contracting laboratory testing services will improve acquisition as well as reduce costs. Best Practices include:

- ***SHARE LABORATORY PERFORMANCE DATA***

**Best Practice:** DoD shares laboratory performance information within DoD and other federal agencies. DoD considers past environmental laboratory performance during laboratory selection.

**Implementation Status:** DoD Components currently operate separate laboratory approval programs, and they typically contract for laboratory services through a prime contractor, using different laboratory acceptance criteria. This results in program dissimilarities which make sharing lab performance data difficult. There is currently no centralized database that tracks laboratory performance analogous to the Architect/Engineer Contract Administration Support System (ACASS) or Construction Contractor Appraisal Support System (CCASS) for tracking contractor performance.

**Discussion:** Setting uniform requirements among DoD components is requisite to effect a level playing field for sharing laboratory performance reviews and performance data. The DoD plans to achieve this goal through development of consolidated program requirements, which parallel those developed for NELAC. Development of an easily accessed database that contains laboratory performance information will facilitate use of quality laboratories and recognition of laboratory problems. The database could include information about laboratory performance similar to contractor performance recorded in ACASS/CCASS. This is an interim step to streamline the system while standard guidance procedures using ISO Guide 25 and ISO Guide 58 are developed and instituted by the NELAC. Under NELAC, lab audit and PT results will be made available in a national database.

**Recommendations:** DoD, DoE, EPA, and other government agencies should share environmental laboratory performance data during laboratory selection and ongoing proficiency testings. The EDQW should resolve program differences that make reciprocity difficult among the components. The EPA should proceed with NELAC. The EDQW should develop a database to track laboratory performance so laboratory strengths and weaknesses can be monitored between components and across programs.

Rating	Increases Quality	Saves Time	Reduces Cost
Share Laboratory Performance Data	A	B	A

- ***USE STANDARD PERFORMANCE BASED LABORATORY QA/QC CONTRACTS***

**Best Practice:** DoD environmental contracts for data services should require laboratories to have in place a quality system that meets ISO Guide 25 criteria and demonstrates compliance through an accreditation program which meets ISO 58 criteria. Contracts should require NELAP accreditation when the program is implemented. DoD contracts for environmental testing services should be based on best value and not purely on cost.

**Implementation Status:** DoD components' laboratory contracts have many of the same general requirements. DoD is increasing the use of quality-based contracts, even for compliance testing services, which were historically low-bid contracts.

**Discussion:** The EDQW is tasked with improving contracting procedures among the services. DoD needs to incorporate additional performance-based standards for acquiring commercial laboratory services. This should include developing contract award criteria, setting on-going performance standards, developing standardized Statements of Work, and having appropriate remedy clauses. Incorporating Performance Based Measurement Systems (PBMS) also introduces contract flexibility, which encourages the use of innovative technologies for sampling and testing activities. Use of innovative technologies can reduce cost, increase timeliness, and increase data reliability.

**Recommendations:** The EDQW should facilitate setting DoD policy for quality systems in sampling and testing and unify laboratory QA system requirements for contract testing among components. These policies can be incorporated in contract specifications and serve as a basis for improving DoD contracts, sharing performance information and exercising remedy clauses. Quality system criteria also provide a basis for awarding value based contracts. In addition, the EDQW should provide templates for use in preparing contracts in the field and new contracts should include Performance Based Measurement Systems (PBMS) flexibility, where appropriate quality systems and accreditations are in place. The EDQW should also investigate the feasibility of using centralized or regional contracting. Part of this investigation should include benchmarking industry and tracking the success of a comparable centralized contracting program which has been in operation for at least one year. Recommendations on the use of centralized contracting will be based on the investigation.

Rating	Increases Quality	Saves Time	Reduces Cost
Use Standard Performance Based Laboratory QA/QC Contracts	B	B	B

- ***MAINTAIN DoD CORE CAPABILITY IN ENVIRONMENTAL DATA ANALYSES***

**Best Practice:** DoD maintains a core capability in environmental testing for the restoration and compliance programs.

**Implementation Status:** Presently DoD components have a core capability in environmental analyses. Numerous initiatives are underway to reduce infrastructure, consolidate, and regionalize in-house laboratory services.

**Discussion:** Although DoD makes extensive use of commercial laboratories for environmental testing, DoD also needs to retain a core technical capability in order to develop contract specifications, manage contracts for testing services, assess contractor performance, and protect the government's interests throughout environmental data collection and analysis activities. The DoD must also maintain core competencies for component unique testing, and provide the capability and capacity to conduct short turn-around, mission critical, and emergent sampling and testing services. As a whole, the DoD currently contracts out about 80% of testing services. Each component continuously reviews these activities for opportunities to improve efficiency and reduce cost through increased out-sourcing. DoD components are also reducing infrastructure and consolidating laboratories to achieve a core capability structure which is cost effective and can be sustained for mission readiness. The Navy is tasked as the lead service for environmental data quality and in this capacity interfaces with private and public sector agencies to coordinate, review, and comment on legislation and regulations which could adversely impact maintaining functions which are inherently governmental or mission critical.

**Recommendation:** The EDQW should develop a core capability model and rationale. This model and rationale should focus on maintaining core laboratory competencies necessary to maintain the capability to perform quality assurance oversight of contracted services and laboratory infrastructure required to support mission needs at minimum costs.

Rating	Increases Quality	Saves Time	Reduces Cost
<b>Maintain DoD Core Capability in Environmental Data Analysis</b>	<b>B</b>	<b>B</b>	<b>B</b>

- **USE A QUALITY ASSURANCE OFFICER**

**Best Practice:** All DoD projects involving environmental analyses should have a DoD employee, acting on behalf of the DoD, as a laboratory data quality assurance officer (QAO). The Quality Assurance Officer (QAO), however named, provides independent review and oversight of data collection. Laboratories performing testing must also have a designated QAO per ISO 25 quality system criteria.

**Implementation Status:** DoD uses QAOs on many large projects. In-house laboratories also have QAOs to provide independent review and QA/QC oversight of laboratory services. Typically, commercial laboratories also have a designated QAO. EPA's Executive Order 5360.1 requires assignment of a quality assurance manager (QAM) to function independently of direct environmental data generation, model development, or technology development responsibility and reports on quality issues to the senior manager having executive leadership authority for the organization. The QAM must possess sufficient technical and management expertise and authority to conduct independent oversight of and assure the implementation of the organization's quality system.

**Discussion:** An ISO Guide 25 based quality system requires that laboratories have a designated QAO. The QAO should be technically qualified and independent of the project manager or laboratory supervisor responsible for the testing performed. The QAO is directly involved in the project from the requirements planning stage through closure. Project QAOs ensure that DQOs are established and incorporated into the Field Sampling Plan (FSP) and Quality Assurance Project Plan (QAPP). The QAO develops a systematic review plan for sampling and data collection. Laboratories must ensure the independence of the QAO in reviewing data and reporting results.

**Recommendation:** The EDQW should review the role of QAO's in laboratory and field testing, sampling operations and project management across DoD. The review should include the description of duties and the level of independence relative to the oversight function. A report will be issued detailing the adequacy of the various QAO oversight functions and any needed improvements.

Rating	Increases Quality	Saves Time	Reduces Cost
Use a Quality Assurance Officer	B	C	B

## NEXT STEPS

The DoD EDQW was established to coordinate the development of environmental policy relative to environmental sampling and testing issues. The charter includes a responsibility to develop and recommend broad military component policy affecting sampling and testing operations that perform analyses of environmental samples in order to:

Ensure the Generation of Environmental Data of Known and Documented Quality;

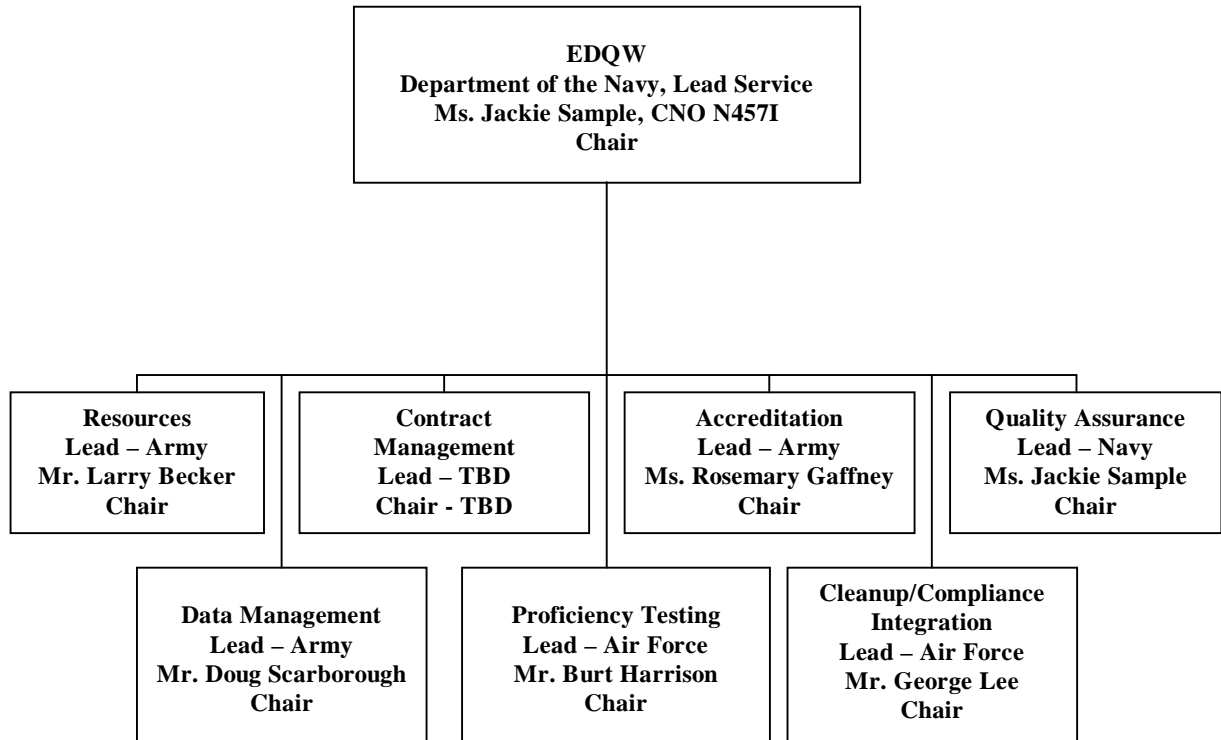
- Reduce Unnecessary Duplication and Program Costs;
- Ensure Compliance with Established Standards;
- Promote Wise Use of Environmental Resources; and
- Improve Overall Performance

The EDQW has established subgroups to carry out its responsibilities. Figure 1 provides the EDQW organizational structure.

The appropriate EDQW subgroup will assess the Best Management Practices, develop a strategy for implementing the recommendation(s) and develop a Plan of Action and Milestones (POA&M) for completion of the recommendations. All POA&Ms should be in place within 90 days from the final issuance of this report. Table 2 shows the lead assignments for these actions. The DASN(ES) will track completion of the actions.

Figure 1

## *EDQW Subgroups*



*Table2*

*Lead Assignments and Actions*

<b><i>Best Management Practice</i></b>	<b><i>EDQW Subgroup</i></b>	<b><i>Lead Service</i></b>	<b><i>Action Officer</i></b>
<b>Use a Systematic Planning Process for Data Collection Activities</b>	<b>QA</b>	<b>Navy</b>	<b>Jackie Sample</b>
<b>Involve Regulators</b>	<b>ALL</b>	<b>Navy</b>	<b>Jackie Sample</b>
<b>Develop DoD Policy and Guidance Documents</b>	<b>ALL</b>	<b>Navy</b>	<b>Jackie Sample</b>
<b>Implement ISO Guide 25</b>	<b>QA</b>	<b>Navy</b>	<b>Jackie Sample</b>
<b>Implement ISO Guide 58</b>	<b>Accreditation</b>	<b>Army</b>	<b>Rosemary Gaffney</b>
<b>Implement ANSI/ASQC E4</b>	<b>QA</b>	<b>Navy</b>	<b>Jackie Sample</b>
<b>Perform Laboratory Audits</b>	<b>Accreditation/QA</b>	<b>Army</b>	<b>Rosemary Gaffney</b>
<b>Include Proficiency Testing Samples</b>	<b>PT</b>	<b>Air Force</b>	<b>Burt Harrison</b>
<b>Require Standard Electronic Data Deliverables</b>	<b>Data Management</b>	<b>Army</b>	<b>Doug Scarborough</b>
<b>Validate Data</b>	<b>Data Management</b>	<b>Army</b>	<b>Doug Scarborough</b>
<b>Institute the National Environmental Laboratory Accreditation Program</b>	<b>Accreditation</b>	<b>Army</b>	<b>Rosemary Gaffney</b>
<b>Share Laboratory Performance Data</b>	<b>PT</b>	<b>Air Force</b>	<b>Burt Harrison</b>
<b>Use Standard Performance Based Laboratory QA/QC Contracts</b>	<b>Contract Management</b>	<b>TBD</b>	<b>TBD</b>
<b>Maintain DoD Core Capability in Environmental Analysis</b>	<b>Resources/QA</b>	<b>Army</b>	<b>Larry Becker Jackie Sample</b>
<b>Use a Quality Assurance Officer</b>	<b>QA</b>	<b>Navy</b>	<b>Jackie Sample</b>